

# Disinfection of Air by Germicidal Vapors and Mists\*

## Laboratory Section

DURING the past year several studies on the effect of dispersing glycol vapors into atmospheres inhabited by human beings have been published. Certain of these investigations have been concerned only with the bactericidal activity of the vapor, while the others were directed primarily toward determining whether or not the incidence of acute respiratory disease could be diminished by maintaining a constant germicidal concentration of the glycol in the atmosphere.

One study on the effect of triethylene glycol vapor on a single respiratory pathogen, namely, the hemolytic streptococcus<sup>1,2</sup> reported in last year's summary, was extended to include a period of relatively low humidities, i.e., 20 per cent to 30 per cent relative humidity.<sup>3</sup> While the reduction of air-borne streptococci was not quite so pronounced as when the relative humidity was maintained at 40 to 50 per cent (a reduction of 95 per cent occurred under these conditions), the effect was still substantial, being only 15 per cent less at the low humidities.

Another study on the intermittent dispersal of propylene glycol into the atmosphere of a crowded room<sup>4</sup> showed a diminution of 80 per cent in the total bacterial content of the air which lasted for about 15 minutes only. Repeated dispersions of the glycol vapor every 15 minutes resulted in a fairly constant lowering of the bacterial population of the air.

The report of the 3 years' study of the clinical application of the disinfection

of air by glycol vapors in a children's convalescent home showed a marked reduction in the number of acute respiratory infections occurring in the wards treated with both propylene and triethylene glycols. Whereas in the control wards 132 infections occurred during the course of the three winters, there were only 13 such instances in the glycol wards during the same period. The fact that the children were, for the most part, chronically confined to bed presented an unusually favorable condition for the prophylactic action of the glycol vapor.<sup>5</sup>

An investigation of the effect of triethylene glycol vapor on the respiratory disease incidence in military barracks<sup>6</sup> brought out the fact that, while for the first 3 weeks after new personnel entered the glycolized area the disease rate remained the same as in the control barracks, the second 3 week period showed a 65 per cent reduction in acute respiratory infections in the glycol treated barracks. Similar effects were observed in respect to air-borne hemolytic streptococci and throat carriers of this microorganism.

Several Canadian workers<sup>7</sup> made a brief study of introducing propylene glycol into army barracks. They found that bactericidal concentrations could not be employed without condensation of the glycol on the walls, windows, etc. (triethylene glycol is greatly superior in this respect). While the study was not continued long enough to secure any significant data on the incidence of respiratory infection in the test and

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control barracks, they did find a reduction of air-borne bacteria in the glycol containing atmosphere amounting to 65 per cent as compared with air of the control spaces.

The use of sodium hypochlorite has been further studied as an aerial disinfectant<sup>8</sup> by means of introducing this agent in the form of hypochlorous acid gas. While this vapor has a marked bactericidal action, it requires a high relative humidity, 70 to 90 per cent, for its optimum effect and also exerts a corrosive action on many metals. Its usefulness would seem to be limited to crowded spaces where there is little ventilation and presumably a high relative humidity.

Substances other than those cited above are being studied for their aerial disinfecting properties. A report on the use of lactic acid as a germicidal vapor<sup>9</sup> indicates that this compound exerts a marked lethal effect on air-borne bacteria when employed in concentrations of 1 gram of lactic acid dispersed in 200,000,000 ml. of air or less, approximately the same order of effectiveness as triethylene glycol. The difficulty about employing this agent in atmospheres occupied by human beings is that it has a slight odor.

Progress continues in the development and testing of apparatus for the dispersion of glycol vapors and the control of their concentration in the air. While the principles of such apparatus have been rather satisfactorily worked out, the actual production of dependable instruments has not yet been achieved. Since this is an entirely new field, a great deal of detail has to be learned by trial and error. In respect to vaporizers, there is little to add to the summary of a year ago. Concerning the device for the automatic regulation of glycol vapor in the air, the glycostat, more can be said. This instrument has now been calibrated so that variations in the intensity of the

light reflected from the glycol-condensing surface of the wheel can be read directly as corresponding degrees of saturation of the air with the glycol vapor present.<sup>10</sup> Thus the glycostat can be set for any desired per cent saturation of glycol in the air, and the vaporizer will maintain this concentration. By means of connecting the glycostat with a milliampererecorder we can obtain a continuous record of the per cent saturation of glycol present in the air, which is of course of great value in conducting experimental studies. It has been found that relative saturation of the air with a glycol vapor is of much more significance in respect to germicidal activity than is the actual content in milligrams of glycol per liter of air.

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